

Relations and Functions

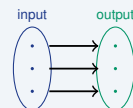
Name: _____ Date: _____ Score: _____ / 18

Quick Review and Helpful Hints

A *relation* is any set of ordered pairs. A *function* is a special relation where every input (x) has *exactly one* output (y). To check: make sure no x -value is paired with two different y -values. On a graph, use the *vertical line test* – a vertical line may touch the graph only once.

▶ **Example:** Is $\{(1, 2), (2, 4), (3, 6)\}$ a function? **Work:** Each input 1, 2, 3 appears just once, so each has only one output.

★ **Answer:** Yes



Each input → exactly one output.

◆ Practice Problems

Tell whether each relation is a function (Yes/No).

- | | |
|--|---|
| <p>1. $\{(1, 2), (2, 3), (3, 4)\}$ _____</p> <p>2. $\{(1, 2), (1, 3), (2, 4)\}$ _____</p> <p>3. $\{(0, 5), (1, 5), (2, 5)\}$ _____</p> <p>4. $\{(4, 1), (4, 2), (5, 3)\}$ _____</p> <p>5. $\{(-1, 0), (0, 1), (1, 2)\}$ _____</p> <p>6. $\{(2, 2), (3, 3), (2, 4)\}$ _____</p> <p>7. $\{(7, 1), (8, 1), (9, 1)\}$ _____</p> | <p>8. $\{(1, 1), (2, 2), (3, 3), (1, 4)\}$ _____</p> <p>9. Inputs 1, 2, 3, 4 each with one y _____</p> <p>10. A vertical line hits the graph twice _____</p> <p>11. $\{(5, 10), (6, 12), (7, 14)\}$ _____</p> <p>12. $\{(0, 0), (0, 1)\}$ _____</p> <p>13. $\{(-2, 3), (-1, 3), (0, 3)\}$ _____</p> <p>14. $\{(1, 5), (2, 6), (3, 7), (2, 8)\}$ _____</p> |
|--|---|

◆ Word Problems

15. A machine gives each input exactly one output. Is it a function? _____
16. Is the relation “person → their birth month” a function? _____
17. Is “ x → its square roots” a function (for example $4 \rightarrow 2$ and -2)? _____
18. Is $\{(1, 2), (2, 4), (3, 6), (4, 8)\}$ a function? _____



Answer Keys

- | | | |
|---------------------------------|----------------------------------|----------------------------------|
| 1. <input type="checkbox"/> Yes | 7. <input type="checkbox"/> Yes | 13. <input type="checkbox"/> Yes |
| 2. <input type="checkbox"/> No | 8. <input type="checkbox"/> No | 14. <input type="checkbox"/> No |
| 3. <input type="checkbox"/> Yes | 9. <input type="checkbox"/> Yes | 15. <input type="checkbox"/> Yes |
| 4. <input type="checkbox"/> No | 10. <input type="checkbox"/> No | 16. <input type="checkbox"/> Yes |
| 5. <input type="checkbox"/> Yes | 11. <input type="checkbox"/> Yes | 17. <input type="checkbox"/> No |
| 6. <input type="checkbox"/> No | 12. <input type="checkbox"/> No | 18. <input type="checkbox"/> Yes |

Step-by-Step Explanations

1. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Each x (1, 2, 3) appears once: yes. So the final answer is Yes.

2. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is $x = 1$ pairs with both 2 and 3: no. So the final answer is No.

3. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Repeated y -values are fine; each x is unique: yes. So the final answer is Yes.

4. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is $x = 4$ pairs with both 1 and 2: no. So the final answer is No.

5. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Every x is different: yes. So the final answer is Yes.

6. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is $x = 2$ pairs with 2 and 4: no. So the final answer is No.

7. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Each x is unique (same y is okay): yes. So the final answer is Yes.

8. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is $x = 1$ appears with 1 and 4: no. So the final answer is No.

9. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is No input is repeated: yes. So the final answer is Yes.

10. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is It fails the vertical line test: no. So the final answer is No.

11. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Each x is unique: yes. So the final answer is Yes.

12. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is $x = 0$ has two outputs: no. So the final answer is No.

13. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is All x -values differ: yes. So the final answer is Yes.

14. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is $x = 2$ pairs with 6 and 8: no. So the final answer is No.

15. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is One output per input: yes. So the final answer is Yes.

16. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Each person has one birth month: yes. So the final answer is Yes.

17. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is 4 has two roots (2 and -2): no. So the final answer is No.

18. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Every x is unique: yes. So the final answer is Yes.



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